

# A Q U A P H Y T E

A NEWSLETTER ABOUT AQUATIC, WETLAND AND INVASIVE PLANTS

## Center for Aquatic and Invasive Plants (CAIP)

with support from

**The Florida Fish and Wildlife Conservation Commission,  
Invasive Plant Management Section**

**UF** | **IFAS Extension**  
UNIVERSITY of FLORIDA

Volume 35 Number 1 Spring 2018

Gainesville, Florida

ISSN 0893-7702

### A LOOK INSIDE

New Beginnings at  
the Center! . . . . .page 1

Update from Mike  
Netherland . . . . .page 2

Update from Dr. Enloe's  
Lab . . . . .page 2

About Jay Ferrell . . .page 3

Dr. Bill Haller  
Retires but . . . . .page 3

Greetings from the  
Getty's Lab . . . . .page 4

Education Initiative  
Update . . . . .page 6

Karen Brown says  
So Long! . . . . .page 8

News from the  
Minteer Lab . . . . .page 9

From the Database  
A sampling of new additions to  
the APIRS database . . .page 10

Program in Fisheries and  
Aquatic Sciences . .page 14

Florida LAKEWATCH  
and Aquatic Plants .page 15

What's Inside the Center's  
Website . . . . .page 16

New Aquatic Plant  
Book . . . . .page 18

## New Beginnings at the Center!

By Jason A. Ferrell, Director, Center for Aquatic and Invasive Plants

This year is shaping up to be like no other year in the history of the Center. It is a year of change, of transition, and excitement. The reason I say this is because two giants at CAIP have announced their retirement.

Dr. Bill Haller retired April 19, 2018. His career has spanned 43 years at the University of Florida and he was the driving force behind the creation of the "Center for Aquatic Weeds" in 1978. During his career, Bill has consistently been the first researcher to identify new problem species and work to develop solutions. This may not seem particularly exciting until you fully understand how this came to be. Aquatic weed control, unlike weed research conducted in crops, has only a few people dedicated to the field. In the early days, there were few procedures in place to actually study these plants and understand how they work. So each time Bill tackled an issue, he often had to invent the techniques or the equipment needed to gather the data. More often than not, other researchers have adopted his techniques to build their lab and reputation. Although Bill is retiring, he is still committed and passionate about managing aquatic weeds. He is planning to teach his Aquatic Weed course this fall and continue doing research.

Another major change is the retirement of Karen Brown. Karen's introduction to invasive plants began when she responded to a "help wanted" sign posted in UF's Student Union over 30 years ago. Who would have ever thought that would result in one of the leading voices in invasive plant education. For the past many years, Karen has been at the forefront of educating and spreading the word about invasive plant species. Her dedication to this field has been manifest in both professionalism and service. She has served on numerous boards of directors (FLEPPC, SE-EPPC, FAPMS, and others) and has edited innumerable newsletters, magazines, blog posts, and other outreach platforms. Like Bill, finding a Karen replacement is impossible, and we will not even try to do this. However, within the next few months, we are hoping to find an individual that can build on the great foundation that Karen will be leaving.

All this said, there are great changes coming for the CAIP. In my opinion, there are two ways to face change: fear of losing what has been earned, or excitement for what the future can bring. Personally, I am excited about our future. Since Bill and Karen are as passionate today as they have ever been, I am excited about their continued influence, wisdom, and support of our new hires. Though they are planning to retire, neither are planning to disappear. I look forward to new beginnings. I look forward to leveraging the expertise and skills of these two to help develop new professionals who will continue to move us forward.

Jason A. Ferrell, Ph.D.  
Professor and Director, Center for Aquatic and Invasive Plants  
jferrell@ufl.edu

## Update from Mike Netherland

By Michael D. Netherland

Starting in January 2017, my research program has been impacted by my ongoing health issues. With that said, I have had a good support team and the productivity remains high.

Josh Wood graduated from my program with a Master's Degree in May 2017. His thesis was on monoecious hydrilla biology and control. He has generated two publications from this work, and he is currently working on final drafts for two more. Josh accepted a job with the SePRO Corporation in June 2017 and he is working on regulatory and labeling issues. This is an important function in aquatic plant management and I know Josh has learned a lot in his time on the job. He is back home in Indiana with his wife, Jennifer, and young son, Griffin, who was born in Gainesville.

Carl Della Torre accepted a job with Alligare LLC in July 2017, and he is working in aquatics and forestry technical sales. I thank Dr. Lyn Gettys for passing him on to me following completion of his Master's degree. Carl was very good at both research and fixing and developing facilities; therefore, I was able to plug him into multiple ongoing projects at the Center and initiate several new field projects.

He had an easygoing manner that allowed him to work with a diversity of people. We are happy to see Carl stay in the field of aquatic plant management. Carl is currently living near Birmingham, AL with his wife, Whitney (a 2017 graduate of the UF Levin College of Law).

Dean Jones is thankfully still with me, and he continues to provide vital and excellent technical support on numerous Florida Fish and Wildlife Conservation Commission (FWC) and U.S. Army Corps of Engineer field projects. He has largely taught himself GIS for large-scale aquatic plant monitoring projects and has shared his expertise with many operational field managers throughout the country. He has also spent countless hours on the water and his insights on plant biology and response to herbicides are greatly appreciated. He is currently developing data collection methods using a drone, and I have no doubt his work will contribute to better incorporation of this technology into the field of aquatic plant monitoring. Dean lives in Auburndale, FL with his wife, Amber.

*Continued on page 15*

## Update from Dr. Enloe's Lab

By Stephen Enloe

The research and extension continues to grind along at the Center. Here are few updates from the Enloe Lab. In August, my first two graduate students (Cody Lastinger and Afsari Banu) completed their MS degrees. Cody's research has opened a whole new door to woody plant control through a reduced hack and squirt approach, where single stems up to six inches in diameter (even larger for certain species) can be treated with a single hack and injection of 0.5 ml of Milestone or Method herbicide. This work has the potential to be a game changer for controlling several species including Chinese tallow tree (*Sapium sebiferum*), Brazilian peppertree (*Schinus terebinthifolius*), bishopwood (*Bischofia javanica*), Australian pine (*Casuarina equisetifolia*), and tungoil tree (*Aleurites fordii*). Afsari's research has contributed to a much clearer understanding of the identification and management of the Uruguayan waterprimrose complex in Florida and documented the incredible issue of fragmentation that occurs with *Ludwigia grandiflora*.

I also recently welcomed a new MS student, Kaitlyn Quincy. Kaitlyn comes to us with a strong background in botany and a big interest in invasive plant management. Her focus is West Indian marsh grass (*Hymenachne amplexicaulis*) biology and management. Her studies will focus on selective control of this problem species with an emphasis on protection of native grasses and other non-

target species. Kaitlyn will be conducting field research at several locations around Florida including Cypress Lake, Myakka River State Park, and the Kissimmee River.

I also have two additional graduate students, MacKenzie Bell and Jessica Solomon. Both have cut their teeth on invasive plant management through the AmeriCorps program and are ready to work on innovative methods for invasive plant control to reduce pesticide use and increase applicator treatment efficiency. Both will be focused on coastal projects from St. Johns County to Cape Canaveral.

Other projects we are moving forward on include understanding the salinity tolerance of Brazilian peppertree where it invades mangroves. This project is a Florida Fish & Wildlife Conservation Commission (FWC) funded effort in strong partnership with Everglades National Park and Big Cypress National Preserve. The project addresses the very basic question on the use of seawater as a foliar spray for suppression or control of peppertree when growing with mangroves. Our previous work has shown that we have no selective herbicides that can be used for broadcast application to mixed stands of peppertree and the mangrove complex without non-target damage. This is a long shot but if we can make it work, the payoff will be great. Dr. Colette Jacono, an excellent scientist at CAIP, is moving this project forward.

*Continued on page 15*

## About Jay Ferrell

By Jason A. Ferrell

Last July I started a new phase of my career as Director of the Center. Though I am new to aquatic weeds, I am not new to weed science or Florida. I began my career at the University of Florida in 2004 as an Assistant Professor in Weed Science. My responsibilities included agronomy crops, pastures, and rights-of-ways. Almost immediately I started working on the invasive tropical soda apple (*Solanum viarum*) that was infesting pastures and natural areas across the southeast. This inevitably led to many discussions with Ken Langeland and Bill Haller about invasive plants and the role the Center has played over the years. As these discussions continued, their passion for aquatic and invasive plants started to rub off on me. In 2013 I was elected as Editor for the *Journal for Aquatic Plant Management*, pulling me further into the water (so to speak). So when the directorship position was announced, I knew it was time to complete my transformation to the aquatic arena.



Now that I am fully integrated into my role as director, I continue to be amazed at the sheer volume of high quality research, extension and teaching programs that have been conducted at the Center over the years. With the retirement of two key people, I feel great pressure to help maintain our momentum. The good news is that the faculty and staff in Gainesville and around the state are as excited and zealous about invasive plants as ever before. With their help, we have the opportunity to craft the direction for the Center that will extend for the next several decades. I am thrilled about this opportunity and look forward to continuing the Center's great tradition of excellence.

Jason A. Ferrell, Ph.D.

Professor and Director, Center for Aquatic and Invasive Plants

jferrell@ufl.edu

---

## Bill Haller retires after 43 years

By Jason A. Ferrell

The day that we never expected, the day that we dreaded, finally came on April 19th. Bill Haller retired as UF/IFAS Professor of Aquatic Weed Management.

When you look over Bill's long and eventful career, a couple of words come to mind. The primary word to describe his career is "first". Some scientists are fortunate enough once in their career to be the first to make an important discovery. Bill has been the first on the scent more times than I can count. He was among the first to use dye to simulate herbicide movement. This work provided key insight into understanding how to use herbicides in flowing water systems. He was among the first to study photosynthesis in hydrilla, which provided basic understanding of the ecology and invasiveness of this plant. He was among the first to show fluridone resistance in hydrilla, even though the best scientific minds in the country said it was impossible. Somehow, Bill consistently showed that he could look around the corner and anticipate the next scientific discovery that would lead this field forward.

The second word that describes Bill is passion. You only need to spend 5 minutes with Bill to see that he has boundless excitement for aquatic plant control. It doesn't matter if you are a new graduate student or a fisherman in a bait shop, he will strike up a conversation about aquatic plants. This passion and enthusiasm, coupled with consistent scientific discovery, has moved the entire field of aquatic plant management forward. We today, and future scientist in this field, owe Dr. Haller a great debt.

Fortunately, Bill retired on the 19th and was back in his office on the 20th. He is even preparing to teach his Aquatic Weed Control course this fall. So thankfully, we will still have time to tap into his knowledge for quite a while longer.

When I asked Bill what he thought when he looks back over a 43-year career, he simply said this: "I have not worked a single day in the past 43 years. This job has been too much fun to be work. It's pretty cool when people pay you for something you would do for free."



I count myself fortunate to know Dr. Haller and I can't wait to have more fun with him as he works into retirement.

Jason A. Ferrell, Ph.D.

Professor and Director, Center for Aquatic and Invasive Plants

jferrell@ufl.edu

## Greetings from the Gettys Lab!

By Lyn A. Gettys

We've been keeping busy at the Aquatic and Wetland Plants Lab which is housed at the University of Florida, Institute of Food and Agricultural Sciences (UF/IFAS) Fort Lauderdale Research & Education Center (FLREC). Our lab has seen a flurry of activity since my last report in Aquaphyte, so let's get you up to speed!

### Research

We're in the final year of our long-term restoration research project at Orlando Wetlands Park in Christmas, FL. The focus of this FWC-funded field study is to evaluate the effects of propagule size and source, plant spacing and seasonality on establishment of giant bulrush (*Schoenoplectus californicus*). We've also continued to study the biology and management of aquatic weeds such as rosette (*Rotala rotundifolia*), crested floatingheart (*Nymphoides cristata*), and fanwort (*Cabomba caroliniana*) in greenhouse, pond and small field trials. We're grateful to the South Florida Water Management District and private industry for providing support for these studies. We've published 16 refereed research papers, 5 articles for Aquatics magazine, and 24 conference abstracts since 2016! In addition to research responsibilities, I continue to be a member of the UF/IFAS Invasive Plants Working Group and am the Aquatic Plants lead for the UF/IFAS Invasive Species Leadership Team.

### Extension and Events

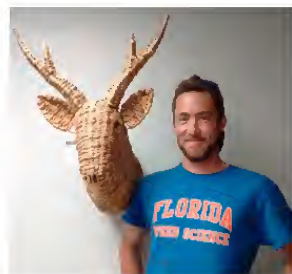
The UF/IFAS Aquatic Weed Control Short Course celebrated "40 years of killing weeds" in 2016, and we had special commemorative swag for attendees of this gigantic annual extension event. The 2017 Short Course was a great success and we're on track to break attendance records in 2018, with 450 attendees on the rolls at the close of regular registration on April 9. Short Course is THE place to prep for exams and to earn CEUs, but it's not the only game in town, of course! In addition to Short Course, I gave 51 extension presentations that qualified for 3,600 CEUs in 2016 and 2017. I was also the Technical Program Committee Chair, Local Site Host, and Organizer for the 20th International Conference on Aquatic Invasive Species (ICAIS) which brought more than 200 delegates from 17 countries to Coral Springs, FL in 2017. Hurricane Irma tried very hard to interfere with ICAIS – in fact, our pre-conference professional tours were cancelled less than two weeks before the conference due to hurricane damage. However, lab member Ian Markovich managed to put together a fantastic day for attendees that included airboats, alligators, and invasive plants.



ICAIS attendees on the pre-conference professional tour.

### Personnel

Kyle Thayer has been with the Aquatic and Wetland Plants Lab since 2013 and continues to be the day-to-day leader of the program. He represents the lab in a number of ways, including giving a poster at the Greater Everglades Ecosystem Restoration (GEER) conference and recruiting interns to join our lab from the Broward College Environmental Science Program which is across the street from our facility in Davie. Kyle cheerfully slogs through muck and high water in leaky waders, harvests rotting plant material using shoulder-length gloves to keep the stink away, and compiles research results – all while working on his bachelor's degree! Kudos, Kyle... kudos!



Kyle Thayer with the much-coveted waterhyacinth deer mount.

Ian Markovich joined the Aquatic and Wetland Plants Lab in 2015 and is Kyle's extremely capable second-in-command. He will receive his hard-earned Bachelor of Science in Environmental Science from Broward College on May 8, 2018. In addition to organizing the awesome professional tour for ICAIS (mentioned above), Ian has presented



Ian Markovich counting bulrush at Orlando Wetlands Park

lab research at a number of conferences, including the Florida Aquatic Plant Management Society meeting in 2016 and GEER, ICAIS, and the Ecological Society of

America meeting in 2017. He and Kyle work together to invent, fabricate, and construct the bizarre tools we need to keep the lab running smoothly. Thanks, Ian!

Joey Sigmon came to the Aquatic and Wetland Plants Lab as a Broward College intern... and we talked him into staying. He brings a lot of things to the table but can always be counted on to encourage us to think outside the box. He has a great love of all things entomological and has been known to hunt down and capture unsuspecting insects during field research site visits. Joey works part-time for us and is taking coursework for his Bachelor of Science in Environmental Science from Broward College. Spread those wings, Joe!

## Students

Sam Sardes completed her graduate program and will be awarded her Master of Science degree at the end of this semester (May 2018). Her MS research was funded in part by the Florida Fish and Wildlife Conservation Commission Graduate Student Mini-Grant program administered by the CAIP. The title of her thesis is, "The effects and implications of both chemical and biological control on water hyacinth IPM with stressors to biocontrol agents (*Neochetina* sp. and *Megamelus scutellaris*)". In a nutshell, she found the waterhyacinth leafhopper *M. scutellaris* did not influence penoxsulam activity on waterhyacinth; efficacy of carfentrazone on waterhyacinth at half the labeled rate was increased when *Neochetina* weevils were present; and waterhyacinth leafhopper survival was reduced when insects were exposed to diquat. Sam presented this and other research results at a number of venues, including the 56th and 57th Aquatic Plant Management Society Meetings in Grand Rapids, MI and Daytona Beach, FL, respectively, and the 19th International Conference on Aquatic Invasive Species in Manitoba, Canada. Sam is now a full-time Research Biologist with Aquatic Systems Inc. in Pompano Beach, FL. Congratulations, Sam!



Sam Sardes

Mohsen Tootoonchi received his Master of Science degree in Soil and Water Sciences at the UF/IFAS Everglades Research and Education Center in Belle Glade, FL in Spring 2016. He joined our lab as a PhD student in May of that same year. He is making steady progress in his dissertation research which focuses on how increased salinity is likely to affect plant assemblages in freshwater systems that are at risk of saltwater intrusion. The title of his dissertation is, "Ecological impacts of climate change and saltwater intrusion on aquatic and invasive

plants". Mohsen has already presented his research at a number of venues, including the 4th Annual South Florida Graduate Research Symposium in Immokalee, FL (where he was awarded Honorable Mention), the 6th University of Florida Water Institute Symposium (where he received the Best Graduate Student Poster Award), and the 2018 Agronomy Department Graduate Student Symposium (where he was awarded Third Place). He has also produced a manuscript outlining his experiments to evaluate different salt sources as proxies for seawater and has submitted it for possible publication in *Aquatic Ecology*. Keep up the great work, Mohsen!



Mohsen Tootoonchi with one of his award-winning posters.

And then there's me... Doc, as my crew calls me! I have statewide extension responsibilities and a lot of extension commitments scheduled for the rest of 2018, plus I'll also be presenting research at a number of scientific meetings. In-state conferences include the Florida State Horticultural Society (Ft. Lauderdale) and the Florida Aquatic Plant Management Society (Daytona Beach). I am also the invited keynote speaker at this year's Florida Lake Management Society (FLMS) meeting in Ft. Lauderdale and I'm organizing a half-day aquatic plants workshop for FLMS attendees that will include a tour of our facilities at FLREC. Out-of-state conferences on the calendar include the Aquatic Plant Management Society (Buffalo, NY) and the American Society for Horticultural Science (Washington, DC), but the one I'm most looking forward to is Neobiota 2018 in Dublin, Ireland. Neobiota has a broad focus on biological invasions of all stripes, but this year's conference includes "The Aquainvaded Session" – a special session devoted exclusively to aquatic invasive plants. I hope to meet up with my Irish colleagues to exchange ideas and develop opportunities to collaborate.

That's all the news that's fit to print from the UF/IFAS Aquatic and Wetland Plants Lab... remember to clean, drain, dry to prevent the transfer of invasive aquatic species! Looking forward to continued collaborations – see you at Short Course!

Lyn A. Gettys, Assistant Professor of Agronomy  
UF/IFAS FLREC, 3205 College Ave., Davie FL 33314  
954-577-6331  
lgettys@ufl.edu

# Florida Invasive Plant Education Initiative & Curriculum Update

By Dehlia Albrecht

The Florida Invasive Plant Education Initiative was created in 2006 to provide educators with the information and resources needed to teach students about the harmful impacts of invasive plants on our natural areas and neighborhoods. Since then, the Education Initiative has offered top-notch workshops, lesson plans, and educational resources for teachers and non-formal educators throughout the state of Florida.

## Plant Camp 2017 Report

Thanks to our sponsors, presenters and teacher participants, another successful Plant Camp was held from June 12th-16th, 2017. Teachers from across the state traveled to Gainesville for this truly unique, hands-on learning experience. Presenters from the UF/IFAS Center for Aquatic and Invasive Plants (CAIP) and affiliated departments, state agencies, and the private sector provided informative sessions throughout the week. This was the 12th such workshop put on by the joint efforts of UF/IFAS CAIP and the Florida Fish and Wildlife Conservation Commission (FWC). A lot has changed over the years, but our focus has always been to create an exciting, novel and interactive learning experience on the topic of invasive plants and their management. After the workshop, teachers are provided with lesson plans, materials, and continuing support to introduce this important topic in their classrooms and to teach it with confidence! Over 300 teachers have attended our workshops and, in turn, have taught approximately 200,000 students over the past years!



Plant Camp attendees learn about aquatic plant management during their field trip to Lake Tohopekaliga in central Florida.

Each year, teachers are given a pre- and post-test and survey to determine attitude changes and knowledge gains. The pre- and post-test includes eleven knowledge-based questions and 4 opinion-based questions that are identical on both tests. Of the knowledge-based questions, the majority showed a positive percent gain from pre- to post-test. The largest gains were on the definition of a native plant (23%), the definition of a non-native plant (17%), and the reasons why some non-native plants are able to spread (28%). There were also significant

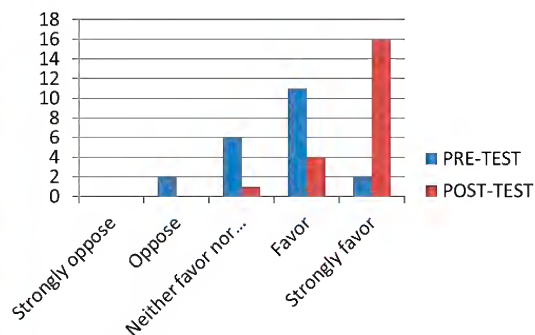
gains on the questions regarding biological control including on the process for testing and approval (13%) and whether biological control poses a threat to native species (11%).

The survey asked the teachers' opinion on methods of invasive plant management – chemical, mechanical, biological, and physical. Below are graphs that illustrate the difference in survey responses from the pre- and post-test for the question, "Please indicate whether you favor or oppose the use of the following methods for invasive plant control." Blue indicates pre-test scores, while red designates post-test scores. For both biological and chemical control, many participants' opinions changed from pre- to post-test to favor these types of control methods. Teachers' written responses expand on their changing opinions:

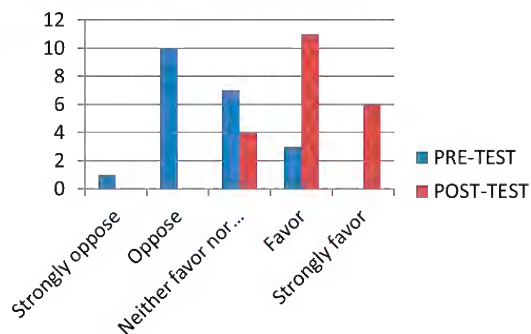
*"I am in favor of whichever method is best for the specific type of invasive as long as all regulations are followed."*

*"Mechanical harvesting is expensive and can have limited effect, in that case it would be best to use a more permanent and cost effective method. In cases where mechanical control is the only option, it is beneficial. Physical control methods are great but have limited effectiveness due to time restraints and manpower. Herbicides are great when used in compliance with EPA regulations."*

Do you favor or oppose the use of biological controls?



Do you favor or oppose the use of chemical controls?



Participants were also asked to rate their likelihood of implementing Plant Camp curriculum. 95% of teachers indicated that they would start teaching their students content about invasive plant species and their distribution in Florida, nearly 81% would teach their students about the development of management plans for aquatic invasive plants, and almost 86% would teach their students about the ecological and economic impacts of invasive plants.

We look forward to hosting our next Plant Camp June 11-15, 2018!

## Lakeville – A Natural Resource Management Activity



One way we continue to support Plant Camp teachers is by visiting their classrooms and implementing lessons on invasive species with their students. For the past 5 years we have received funding through FWC to visit classrooms across the state each year to implement *Lakeville – A Natural Resource Management Activity*. *Lakeville* teaches students about ecosystems, natural resource management, and civic responsibility. Three “sessions” make up the Lakeville Unit, each designed to encourage critical thinking while enhancing students’ environmental knowledge. Sessions 1 and 2 provide students with background information and Session 3 brings it all together in a fun game-show style activity that gives students a chance to use their persuasive debate skills and make management decisions about a local freshwater habitat. Through the course of the *Lakeville* unit, students learn how social, political, and environmental concerns all must be considered in order to make management decisions. The goal is to prepare students for their future role as citizens and environmental stewards. Students take pre- and post-tests to measure knowledge gains after participating in the Lakeville activity. In the 2016-2017 school year, we saw an average knowledge gain of 17% overall.

## Introducing Dr. Deah Lieurance

By Karen Brown

Dr. Deah Lieurance received her PhD from Wright State University in 2012 and spent 3 years in Ft. Lauderdale at the USDA Invasive Plant Research Laboratory participating in research on the biological control of *Melaleuca* and *Schinus*. Many of our readers already know Deah through her work since 2013 coordinating the UF/IFAS Assessment of Non-Native Plants in Florida’s Natural Areas.\* Since then, she helped redesign the Assessment website and added over 100 species to the species database. Although already an employee of the Center in that role, Deah is now an Assistant Extension Scientist. In her expanded role, she will be co-advising graduate student Tabitha Petri with Dr. Luke Flory as the lead. She will also be working to include all of the species listed on the Florida Exotic Pest Plant Council’s 2017 list and the Florida Invasive Species Partnership’s Early Detection/Rapid Response target species to the UF/IFAS Assessment database. She is also interested in conducting research on the invasion risk of alternative crops (e.g. biofuel and biomass species), specifically looking at species that are being promoted to citrus farmers negatively affected by the citrus greening.



Welcome to your expanded role and new title, Deah!

Contact Deah at:

Deah Lieurance, Ph.D.

Assistant Extension Scientist

Center for Aquatic and Invasive Plants

352-294-1580

dmlieurance@ufl.edu

Karen Brown, Coordinator, Educational Media/Communications  
University of Florida/IFAS  
Center for Aquatic and Invasive Plants

\*The IFAS Assessment, as it is commonly known, uses literature-based assessment tools to evaluate the invasion risk of non-native species that occur in the state, new species proposed for introduction, and novel agricultural and horticultural selections, hybrids, and cultivars. The overarching goal is to reduce non-native plant invasions in Florida and throughout the Southeast US for protection of natural and agricultural areas.



The CAIP Invasive Plant Education Team  
Dehli Albrecht, Program Coordinator  
Lynda Dillon, Program Assistant  
Charlie Bogatescu, Web/IT Specialist  
caip-education@ufl.edu

## Karen Brown says So Long!

By Karen Brown

I started working for Vic Ramey at the UF/IFAS Center for Aquatic Weeds in a part-time, temporary position in 1983 while a student at UF. The index card on the bulletin board said someone who could type was needed. I had never heard of aquatic weeds. I had hoped to get a degree that would enable me to work outdoors as my passion is nature and being outside. However, my lack of science and math background and the fact that I was a “student [10 years] over the traditional age” soon pushed me towards my natural skills (and easier courses) in the English Department. In December 1987, I had graduated and was still working at the Center, now fascinated by aquatic plants and the science surrounding them, and was hired in a full-time position. And 30 years later, to my astonishment, I am about to retire from the same place. Thanks to some of the numerous projects I have been involved in, I did have some opportunities to work in the great outdoors. A multi-year grant to create video ID segments on aquatic plants sent me out into aquatic areas all over the state with videographer, Phil Chiocchio, and coordinator, Vic Ramey. We met a lot of aquatic plant managers who took us wherever we needed to go to shoot plants both above and below water. They waited patiently while we got every plant part and every angle...twice. We visited springs, rivers, lakes, and reservoirs and saw otters, manatees, alligators, and turtles. The end result was a lot of new friendships and memories and more than 100 plant ID videos, now very dated looking but still useful on the Center’s many webpages. Since I spent the rest of my time on the burgeoning Aquatic Plant Information Retrieval System (APIRS), I attended graduate school part-time and earned a Master’s degree in Library and Information Science (MLIS) from the University of South Florida in 2001. With the untimely passing of Vic Ramey in 2005, I assumed the position of Coordinator of the Center’s Information Office. Since then, I have managed and contributed to the Center’s primary website, subsequent websites on the Invasive Plant Education Initiative and Plant Management in Florida Waters, and continue to work on APIRS. I also edit the AQUAPHYTE newsletter, with this being the 35th year of its publication. In addition, I branched out to become a member of numerous related professional organizations. I edited the quarterly magazine, *Wildland Weeds*, for the Florida Exotic Pest Plant Council (FLEPPC) from 2003 – 2014, and have been an officer since 2003. I have been a board member of the Southeast Exotic Pest Plant Council (SE-EPPC) for many years and currently serve as President. I have been on the board of the Florida Aquatic Plant Management Society off and on from 2011 to the present and continue to edit their *Aquatics* magazine as needed. I assist as the Website Committee chair for the national Aquatic Plant Management Society.

I’ve been able to attend a lot of great conferences over the years and will miss meeting colleagues and learning more about invasive plants. The highlight was representing the Center in 2002 at the 11th International Symposium on Aquatic Weeds at the European Weed Research Society in Landes, FRANCE. For some reason (who cares?), both our director, Dr. Randall Stocker, and internationally known aquatic weed scientist, Dr. Bill Haller, could not attend and I swiftly volunteered. It was an awesome trip where I met many colleagues who had been contributing literature to APIRS for years. We heard presentations in French translated to English through headphones, and vice versa. I’m sure my presentation sounded much more elegant in French but I didn’t have the opportunity to hear it. It was a very rewarding and exciting trip.



I still enjoy doing what I do with all the people and groups I work with. I’ll miss playing my role in newsletters, listserves, websites, conferences and everything in between. I’m saddened to leave my aquatic and invasive plant knowledge and skills behind but I look forward to more of the nature I always craved. The truth is that I always envied your jobs. Keep whacking those weeds and doing that research, everybody! Your work is crucial, your passion is inspiring, and I hold you all in the highest regard.

Karen Brown, Coordinator, Educational Media/Communications  
University of Florida/IFAS  
Center for Aquatic and Invasive Plants

## News from the Minteer Lab

By Carey Minteer

Greetings from Fort Pierce! The last year has been extremely busy in the Minteer Lab. This was my first year with UF/IFAS and the Center for Aquatic and Invasive Plants. The lab has several projects underway.

Our projects include research on both aquatic and terrestrial weeds. Currently, our primary focus is the development and assessment of potential biological control agents for Brazilian peppertree (*Schinus terebinthifolia*) and the implementation of biological control of air potato (*Dioscorea bulbifera*), but we also have projects on the weed targets earleaf acacia (*Acacia auriculiformis*) and water hyacinth (*Eichhornia crassipes*). Currently, we have two leaf-galling insects under development for control of Brazilian peppertree, *Calophya terebinthifolii* and *Calophya lutea*. PhD candidate Patricia Prade completed host range testing for both species, indicating that both agents are host specific to Brazilian pepper. Two additional agents, the Brazilian peppertree thrips (*Pseudophilothrips ichini*) and the yellow Brazilian peppertree galler (*Calophya latiforceps*) have been recommended for release by the USDA-APHIS Technical Advisory Group for Biological Control Agents of Weeds. We are currently awaiting release permits for both of these agents. Once release permits are granted, we will begin mass-rearing and releasing both agents in the state.



Carolina Arguijo and Patricia Prade in quarantine

biological control, in addition to providing air potato beetles for homeowners and land managers that have air potato infestations on their land. In 2017 in cooperation with the Florida Department of Agriculture and Consumer Services Division of Plant Industry, we reared over 109,000 air potato beetles for use by the public. Our education efforts increased self-assessed knowledge (pre- vs. post-) of invasive plants and classical biological control of participants surveyed by 227% and 401%, respectively.

Native-range exploration for potential biological control agents for the invasive earleaf acacia continues in Australia in cooperation with the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the USDA-ARS Invasive Plant Research Lab. Several candidate agents have been found and preliminary host-range testing has begun in Australia. Insects will be shipped to the UF/IFAS Hayslip Biological Control Research and Containment Lab in Ft. Pierce this summer to continue testing.

In our aquatic research, Dr. Eutyclus Kariuki, a post-doctoral scholar, and our intern, Larissa Bini, investigated the novel use of a biological control agent, *Megamelus scutellaris*, for waterhyacinth, using a native parasitoid, *Kalopolytnema ema*. Preliminary evidence shows that, when given a choice, the parasitoid prefers laying eggs in the native host *Megamelus davisii*. Studies on this and how it may affect natural systems and the biological control of waterhyacinth are ongoing.



This year we added an education component to our mass-rearing program for the air potato leaf beetle. We have organized several "Air Potato Challenge Day" events in Extension offices across Florida. During these public events, we educate the public about invasive species and

Dr. Carey Minteer  
UF/IFAS Indian River Research and Education Center  
2199 S Rock Road, Fort Pierce, FL 34945  
772-577-7379  
c.minteerkillian@ufl.edu

## FROM THE DATABASE

The APIRS database now contains more than 96,000 annotated citations to invasive aquatic, wetland and natural area plant literature in Florida and elsewhere. A small sample of recent addition to the APIRS collection is provided below. References cited include peer-reviewed research articles, government reports, books and book chapters, dissertations and theses, and gray literature such as abstracts from proceedings. Some materials are available as PDF files attached to the record or links to online sources. To obtain full-text of other materials, search online or contact your nearest academic library.

Visit the APIRS database at [apirs.plants.ifas.ufl.edu](http://apirs.plants.ifas.ufl.edu)

For help with a literature search from APIRS, contact Lisa Olsen at [leo0303@ufl.edu](mailto:leo0303@ufl.edu).

## BASIC RESEARCH

### A new weed in Florida, *Spermacoce latifolia*, and the distinction between *S. alata* and *S. latifolia* (Spermacoceae: Rubiaceae).

Castanea 82(2):114-131 (September 2017). Wiersma JH; Delprete PG; Kirkbride JH; Franck AR.

### Historical museum specimens reveal the loss of genetic and morphological diversity due to local extinctions in the endangered water chestnut *Trapa natans* L. (Lythraceae) from the southern alpine lake area.

Botanical Journal of the Linnean Society 185(3):343-358 (November 2017). Frey D; Reisch C; Narduzzi-Wicht B; Baur EM; et al.

### Mycoherbicidal potential of

*Phaeoacremonium italicum*, a new pathogen of *Eichhornia crassipes* infesting Harike Wetland, India. Mycobiology 44(2):85-92 (June 2016). Singh B; Saxena S; Meshram V; Kumar M.

### Species richness and taxonomic distinctness of lake macrophytes along environmental gradients in two continents.

Freshwater Biology 62(7):1194-1206 (July 2017). Alahuhta J; Toivanen M; Hjort J; Eecke F; et al.

### Buried alive: Aquatic plants survive in 'ghost ponds' under agricultural fields.

Biological Conservation 212:105-110 Part: A (August 2017). Alderton E; Sayer CD; Davies R; Lambert SJ; et al.

### Development of taxonomic tools for the separation of *Ludwigia hexapetala* and *Ludwigia grandiflora* in Florida.

Proceedings 2017 Annual Conference, Florida Exotic Pest Plant Council (FLEPPC), 12-14 April 2017, Melbourne, Florida; (abstract, p. 19). Jacono CC; Banu A; Enloe SF.

### *In vitro* propagation and shoot encapsulation as tools for *ex situ* conservation of the aquatic plant *Ludwigia palustris* (L.) Ell.

Plant Biosystems 149(5):855-864 (3 September 2015). Fontanili L; Lucchesini M; Mensuali-Sodi A.

### *In vitro* propagation, micromorphological studies and *ex vitro* rooting of

*Alternanthera philoxeroides* (Mart.) Griseb.: an important aquatic plant.

Aquaculture International 25(1):423-435 (February 2017). Shekhawat MS; Manokari M; Revathi J.

### Anatomical traits related to stress in high density populations of *Typha angustifolia* L. (Typhaceae).

Brazilian Journal of Biology 77(1):52-59 (February 2017). Correa FF; Pereira MP; Madail RH; Santos BR; et al.

### Aquatic dicotyledons of North America: ecology, life-history, and systematics; CRC Press Taylor & Francis Group, Boca Raton, Florida; 1350 pp. (2017). Les DH.

### Vegetative propagation capacity of invasive alligator weed through small stolon fragments under different treatments.

Scientific Reports 7:01-10 (6 March 2017). Peng XM; Li HY; Yang YF; Zhi H; et al.

### Isolation and identification of two potential phytotoxic substances from the aquatic fern *Marsilea crenata*.

Journal of Plant Biology 60(1):75-81 (February 2017). Islam MS; Iwasaki A; Suenaga K; Kato-Noguchi H.

### *Ludwigia litoranea* (Onagraceae), a new species from coastal southern Brazil.

Phytotaxa 230(2):183-188 (8 October 2015). Pesamosca SC; Boldrini II.

### Climate warming and heat waves affect reproductive strategies and interactions between submerged macrophytes.

Global Change Biology 23(1):108-116 (January 2017). Li ZQ; He L; Zhang H; Urrutia-Cordero P; et al.

### Effect of submerged macrophyte restoration on improving aquatic ecosystem in a subtropical, shallow lake.

Ecological Engineering 106:578-587 (2017). Zeng L; He F; Dai Z; Xu D; et al.

### Photosynthetic inorganic carbon acquisition in 30 freshwater macrophytes.

Aquatic Botany 140:48-54 (May 2017). Yin LY; Li W; Madsen TV; Maberly SC; Bowes G.

### Hitching a ride: Seed accrual rates on different types of vehicles.

Journal of Environmental Management 206:547-555 (15 January 2018). Rew LJ; Brummer TJ; Pollnac FW; Larson CD; Taylor KT; et al.

### Leaf ontogeny and meristem activity of *Typha domingensis* Pers. (Typhaceae) under different phosphate concentrations.

Aquatic Botany 136(1):43-51 (January 2017). Correa FF; Pereira MP; Kloss RB; de Castro EM; Pereira FJ.

### Acclimation of photosynthesis to supersaturated CO<sub>2</sub> in aquatic plant bicarbonate users.

Freshwater Biology 61(10):1720-1732 (October 2016). Hussner A; Mettler-Altmann T; Weber APM; Sand-Jensen K.

### Impacts of climate change on submerged and emergent wetland plants.

Aquatic Botany 135:3-17 (November 2016). Short FT; Kosten S; Morgan PA; Malone S.

### A new species of *Hydrellia* (Diptera: Ephydriidae) mining *Hydrilla verticillata* (Hydrocharitaceae) leaves in Singapore.

Austral Entomology 55(4):353-359 (November 2016). Bownes A; Deeming J.

## INVASION BIOLOGY

### The breeding system and pollination of woody species in a subtropical forest invaded by alien plants.

Boletín de la Sociedad Argentina de Botánica 52(4):675-687 (December 2017). Montaldo NH; Mantese AI; Roitman GG.

### Disturbance, trait similarities, and trait advantages facilitate the invasion success of *Alternanthera philoxeroides* (Mart.) Griseb.

CLEAN-Soil Air Water 45(9): Article Number: 1600378 (September 2017). Wang T; Hu JT; Gao YY; Yu D; et al.

### An isotopic study of diet and muscles of the green iguana (*Iguana iguana*) in Puerto Rico.

Journal of Herpetology 46(2):167-170 (June 2017). Govender Y; Munoz MC; Camejo LAR; Puente-Rolon AR; et al.

### Rapid colonization of degraded mangrove habitat by succulent salt marsh.

South African Journal of Botany 107(Special Issue, SI):129-136 (November 2016). Mbense S; Rajkaran A; Bolosha U; Adams J.

### Invasive plant management creates ecological traps for snakes.

Biological Invasions 19(1):443-453 (January 2017). Carter ET; Ravesi MJ; Eads BC; Kingsbury BA.

**Biological invasion by a benthivorous fish reduced the cover and species richness of aquatic plants in most lakes of a large North American ecoregion.**  
Global Change Biology 22(12):3937-3947 (December 2016). Bajer PG; Beck MW; Cross TK; Koch JD; et al.

**The contemporary records of aquatic plants invasion through the Danubian floodplain corridor in Serbia.**  
Aquatic Invasions 11(4):381-395 (October 2016). Andelkovic AA; Zivkovic MM; Cvijanovic DL; Novkovic MZ; et al.

**Phylogeography reveals a potential cryptic invasion in the Southern Hemisphere of *Ceratophyllum demersum*, New Zealand's worst invasive macrophyte.**  
Scientific Reports 7: Article Number: 16569 (29 November 2017). Hyldgaard B; Lambertini C; Brix H.

**Differences in interactions of aboveground and belowground herbivores on the invasive plant *Alternanthera philoxeroides* and native host *A. sessilis*.**  
Biological Invasions 18(12):3437-3447 (December 2016). Wei H; He MY; Lu XM; Ding JQ.

**Impact of climate warming on carbon metabolism and on morphology of invasive and native aquatic plant species varies between spring and summer.**  
Environmental and Experimental Botany 144:1-10 (December 2017). Gillard M; Thiebaut G; Rossignol N; Berardocco S; et al.

**The amphibious invader: rooted water hyacinth's morphological and physiological strategy to survive stranding and drought events.**  
Aquatic Botany 143:41-48 (October 2017). Venter N; Cowie BW; Witkowski ETF; Snow GC; et al.

**Effects of substrate nutrients on growth of three submersed aquatic plants.**  
Journal of Aquatic Plant Management 56(1):39-46 (January 2018) [OPEN ACCESS] Gosselin JR; Haller WT; Gettys LA; Griffin T; Crawford ES.

**Long-term chlorophyll trends in Florida lakes.**  
Journal of Aquatic Plant Management 56(1):47-56 (January 2018) [OPEN ACCESS] Canfield, DE; Bachmann, RW; Hoyer, MV.

## UTILIZATION

**Potential of uncultivated, harmful and abundant weed as a natural georeinforcement material.**  
Advances in Civil Engineering Materials 5(1):276-288 (2016). Bordoloi S; Garg A; Sreedeeep S.

**Competitive sorption of heavy metals by water hyacinth roots.**  
Environmental Pollution 219:837-845 (December 2016). Zheng J-C; Liu H-Q; Feng H-M; Li W-W; et al.

**Plant-based remedies for wolf bites and rituals against wolves in the Iberian Peninsula: Therapeutic opportunities and cultural values for the conservation of biocultural diversity.**  
Journal of Ethnopharmacology 209:124-139 (14 September 2017). Gonzalez JA; Carvalho AM; Vallejo JR; Amich F.

**Assessment of calorimetric antibacterial and fastness properties of silk fabric dyed with *Casuarina equisetifolia* L. leaf extract.**  
Indian Journal of Traditional Knowledge 16(4):714-719 (October 2017). Swamy VN.

**Formulation of *Eichhornia crassipes* derived lutein: coconut oil micro-emulsion for sustained ophthalmic drug delivery.**  
International Journal of Pharmaceutical Sciences and Research 8(10):4159-4171 (October 2017). Poorani TR; Vellingirra V; Deepa VS; Abdula AN.

**Revealing crosstalk of plant and fungi in the symbiotic roots of sewage-cleaning *Eichhornia crassipes* using direct *de novo* metatranscriptomic analysis.**  
Scientific Reports 5: Article Number: 15407 (16 October 2015). Luo B; Gu W; Zhong JY; Wang Y; et al.

**Desalination of sea water with aquatic lily (*Eichhornia crassipes*).**  
Environmental Science and Pollution Research 24:25676-25681 (2017). Arámburo-Miranda IV; Ruelas-Ramírez EH.

**Nutrient changes and biodynamics of *Eisenia fetida* during vermicomposting of water lettuce (*Pistia* sp.) biomass: a noxious weed of aquatic system.**  
Environmental Science and Pollution Research 24(1):199-207 (January 2017). Suthar S; Pandey B; Gusain R; Gaur RZ; et al.

**Turning a problem into profit: using water hyacinth (*Eichhornia crassipes*) for making handicrafts at Lake Alaotra, Madagascar.**  
Economic Botany 70(4):365-379 (December 2016). Rakotoarisoa TF; Richter T; Rakotondramanana H; Mantilla-Contreras J.

## MECHANICAL/CULTURAL CONTROL

**From weed biology to successful control: an example of successful management of *Ludwigia grandiflora* in Germany.**  
Weed Research 56(6):434-441 (December 2016). Hussner A; Windhaus M; Starfinger U.

**Mowing submerged macrophytes in shallow lakes with alternative stable states: battling the good guys?**  
Environmental Management 59(4):619-634 (April 2017). Kuiper JJ; Verhofstad MJJM; Louwers ELM; Bakker ES; et al.

**Management of *Nymphoides peltatum* using water level fluctuations in freshwater lakes of Kashmir Himalaya.**  
Limnology 18(2):219-231 (April 2017). Khanday SA; Yousuf AR; Reshi ZA; et al.

**Mechanical harvesting effectively controls young *Typha* spp. invasion and unmanned aerial vehicle data enhances post-treatment monitoring.**  
Frontiers in Plant Science 8: Article Number 619; (April 25 2017). Lishawa SC; Carson BD; Brandt JS; Tallant JM; et al.

**Physical controls on the distribution of the submersed aquatic weed *Egeria densa* in the Sacramento-San Joaquin Delta and implications for habitat restoration.**  
San Francisco Estuary and Watershed Science 14(1); 22 pp. (March 2016). Durand J; Fleenor W; McElreath R; Santos MJ; et al.

**Effects of mechanical macrophyte control on suspended sediment concentrations in streams.**  
New Zealand Journal of Marine and Freshwater Research 51(2):254-278 (June 2017). Greer MJ; Hicks AS; Crow SK; Closs GP.

## CHEMICAL CONTROL/ HERBICIDES

**Can low rates of imazapyr or glyphosate improve graminicide activity on torpedograss?**  
Journal of Aquatic Plant Management 56(1):13-17 (January 2018). Enloe SF; Netherland MD; Lauer DK.

**Aerial herbicide spray to control invasive water hyacinth (*Eichhornia crassipes*): water quality concerns fronting fish occupying a tropical floodplain wetland.**  
Tropical Conservation Science 10:1-10 (11 December 2017). Waltham NJ; Fixler S.

**Curlyleaf pondweed (*Potamogeton crispus*) control using copper-ethylenediamine alone and in combination with endothall.**  
Journal of Aquatic Plant Management 55(2):116-119 (July 2017). Turnage G; Madsen JD.

**Efficacy of herbicide active ingredients against aquatic weeds [Publication SS-AGR-44].**  
University of Florida, Agronomy Department, UF/IFAS Extension, Gainesville, Florida; 10 pp. (February 2018). Enloe SF; Langeland K; Haller WT.

### Herbicide assays for predicting or determining plant responses in aquatic systems.

Journal of Aquatic Plant Management 56s:67-73 (October 2017) (Special Issue: Research Methods). MacDonald G; Netherland M.

### Divergent responses of cryptic invasive watermilfoil to treatment with auxinic herbicides in a large Michigan lake.

Lake and Reservoir Management 32(4):366-372. (2016) Parks SR; McNair JN; Hausler P; Tynning P; Thum RA.

### Shoreline drizzle applications for control of incipient patches of yellowflag iris (*Iris pseudacorus*).

Invasive Plant Science and Management 9(3):205-213 (July-September 2016). DiTomaso JM; Kyser GB.

### Glyphosate redirects wetland vegetation trajectory following willow invasion.

Applied Vegetation Science 20(4):620-630 (October 2017). Burge OR; Bodmin KA; Clarkson BR; Bartlam S; et al.

### Efficacy of aquatic herbicides on dwarf rotala (*Rotala rotundifolia*).

Journal of Aquatic Plant Management 55(1):13-18 (January 2017). Della Torre CJ; Gettys LA; Haller WT; Ferrell JA; Leon R.

### Use of herbicides in areas of high water exchange; practical considerations.

Journal of Aquatic Plant Management 56s:39-43 (October 2017) (Special Issue: Research Methods). Getsinger KD; Netherland MD.

### Lessons from a decade of lake management: effects of herbicides on Eurasian watermilfoil and native plant communities.

Ecosphere 8(4): Article Number: e01718 (April 2017). Kujawa ER; Frater P; Mikulyuk A; Barton M; et al.

### Fate of flumioxazin in aquatic plants: two algae (*Pseudokirchneriella subcapitata*, *Synechococcus* sp.) duckweed (*Lemna* sp.) and water milfoil (*Myriophyllum elatinoides*).

Journal of Agricultural and Food Chemistry 65(40):8813-8822 (11 October 2017). Ando D; Fujisawa T; Katagi T.

### Evaluation of three grass-specific herbicides on torpedograss (*Panicum repens*) and seven non-target, native aquatic plants.

Journal of Aquatic Plant Management 55(2):65-70 (July 2017). Enloe SF; Netherland MD.

### When the upland scourge meets the water's edge: best management practices for cogongrass along water.

Aquatics 38(1):6-10. Enloe S.

### Relationships between water chemistry and herbicide efficacy of Eurasian watermilfoil management in Wisconsin lakes.

Lake and Reservoir Management 33(1):1-7 (March 2017). Frater P; Mikulyuk A; Barton M; Nault M; et al.

### Effectiveness of diquat, both isolated and associated with copper sources in controlling the *Hydrilla verticillata* submerged macrophytes and *Ankistrodesmus gracilis* microphyte.

Planta Daninha 35: Article Number: e017160653 (2017.). Malaspina IC; Cruz C; Garlich N; Bianco S; et al.

### Mesocosm response of crested floating heart, hydrilla, and two native emergent plants to florypyrauxifen-benzyl: A new arylpicolinate herbicide.

Journal of Aquatic Plant Management 56(1):57-62. Beets J, Netherland M.

## BIOLOGICAL CONTROL

### Herbivory by biological control agents improves herbicidal control of waterhyacinth (*Eichhornia crassipes*).

Invasive Plant Science and Management 10(3):271-276 (July-September 2017). Tipping PW; Gettys LA; Minter CR; Foley JR; Sardes SN.

### Impact of field densities of the naturalized defoliator *Caloptilia triadica* (Lepidoptera: Gracillariidae) on the invasive weed Chinese tallowtree.

Environmental Entomology 46(6):1305-1312 (December 2017). Wheeler GS; Hight SD; Wright SA.

### A review of the integration of classical biological control with other techniques to manage invasive weeds in natural areas and rangelands.

Biocontrol 63(1 Special Issue: SI):71-86 (February 2018). Lake EC; Minter CR.

### Impact of the arundo wasp, *Tetramesa romana* (Hymenoptera: Eurytomidae), on biomass of the invasive weed, *Arundo donax* (Poaceae: Arundinoideae), and on revegetation of riparian habitat along the Rio Grande in Texas.

Biocontrol Science and Technology 27(1):96-114 (2017). Moran PJ; Vacek AT; Racelis AE; Pratt PD; et al.

### The biological control of aquatic weeds in South Africa: current status and future challenges.

Bothalia 47(2): Article Number: a2152 (2017). Hill MP; Coetzee J.

### The control of floating macrophytes by grass carp in net cages: experiments in two tropical hydroelectric reservoirs.

Aquaculture Research 48(7):3356-3368 (July 2017). Domingues FD; Starling FLRM; Nova CC; Loureiro BR; et al.

### Can leaf-mining flies generate damage with significant impact on the submerged weed *Lagarosiphon major*?

Biocontrol 61(6):803-813 (December 2016). Mangan R; Baars JR.

### Folivory and disease occurrence on *Ludwigia hexapetala* in Guntersville Reservoir, Alabama.

Journal of Aquatic Plant Management 55(1):19-25 (January 2017) (pp. 19-25). Harms NE; Shearer JF; Grodowitz MJ.

### Naturally occurring phytopathogens enhance biological control of water hyacinth (*Eichhornia crassipes*) by *Megamelus scutellaris* (Hemiptera: Delphacidae), even in eutrophic water.

Biological Control 103:261-268 (December 2016). Sutton GF; Compton SG; Coetzee JA.

### First report of spot blight on water spinach (*Ipomoea aquatica*) caused by *Stagonosporopsis cucurbitacearum* in China.

Plant Disease 101(5):838-839 (May 2017). Liu PQ; Wei MY; Zhu L; Li BJ; et al.

### The reproductive viability of grass carp (*Ctenopharyngodon idella*) in the western basin of Lake Erie.

Journal of Great Lakes Research 43(2):405-409 (April 2017). Wieringa JG; Herbst SJ; Mahon AR.

### Early-season dynamics of alligatorweed biological control by *Agasicles hygrophila* in Louisiana and Mississippi.

Journal of Aquatic Plant Management 55(2):89-95 (July 2017). Harms NE; Shearer JF.

### Grass carp for control of hydrilla in stormwater retention ponds.

Florida Native Plant Society, Pinellas Chapter. PowerPoint Presentation; 45 pp. (August 2015). Franke E.

### Dominance of *Myriophyllum spicatum* in submerged macrophyte communities associated with grass carp.

Knowledge and Management of Aquatic Ecosystems 417: Article Number: 24 (2016). Yu JL; Zhen W; Guan BH; Zhong P; et al.

## REVIEW

### Evaluation of blue tilapia (*Oreochromis* Seventeen years of grass carp: an examination of vegetation management and collateral impacts in Ball Pond, New Fairfield, Connecticut.

Lake and Reservoir Management 33(1):84-100 (March 2017). June-Wells M; Simpkins T; Coleman AM; Henley W; et al.

### A systematic review of context bias in invasion biology.

PLoS ONE 12(8): Article Number: e0182502 (2017). Warren RJ; King JR; Tarsa C; Haas B; et al.

**Macrophytes-cyanobacteria allelopathic interactions and their implications for water resources management-A review.**  
Limnologia 63:122-132 (March 2017). Mohamed ZA.

**Ecological impacts of winter water level drawdowns on lake littoral zones: a review.**  
Aquatic Sciences 79(4):803-824 (October 2017). Carmignani JR; Roy AH.

**Management and control methods of invasive alien freshwater aquatic plants: a review.**  
Aquatic Botany 136(1):112-137 (January 2017). Hussner A; Stiers I; Verhofstad MJM; Bakker ES; et al.

**The biological control of aquatic weeds in South Africa: current status and future challenges.**  
Bothalia 47(2): Article Number: a2152 (2017). Hill MP; Coetzee J.

**Allelopathic effects of submerged macrophytes on phytoplankton.**  
Allelopathy Journal 40(1):1-22 (January 2017). Gao YN; Dong J; Fu QQ; Wang YP; et al.

## THESES/DISSERTATIONS

**Evaluation of blue tilapia (*Oreochromis aureus*) for duckweed (*Lemna minor*) control in South Carolina's private waters.**  
Ph.D. Dissertation (Wildlife and Fisheries Biology); Clemson University, Clemson, South Carolina; 115 pp. (December 2015). Heaton WC.

**Behavioral and physiological ecology of mosquito disease vectors (Diptera: Culicidae) as a function of aquatic macrophyte invasions.**  
Ph.D. Dissertation (Environmental Science) University of California, Berkeley, California; 90 pp. (Spring 2017). Turnipseed RK.

**Invasive elodea threatens remote ecosystem services in Alaska: a spatially-explicit bioeconomic risk analysis.**  
Ph.D. Dissertation (Socio-Bioeconomics: Interdisciplinary) University of Alaska Fairbanks, Fairbanks, Alaska; May 2017, 192 pp. Schwoerer T.

**Aquatic macrophytes at the interface of ecology and management.**  
Ph.D. Dissertation (Freshwater and Marine Sciences); University of Wisconsin-Madison, Madison, Wisconsin; 149 pp. (March 2017). Mikulyuk A.

**Impacts of invasive *Phragmites australis* on diamondback terrapin nesting.**  
M.S. Thesis (Biology); College of William and Mary, Williamsburg, Virginia; 62 pp. (August 2016). Cook EC.

**Giant salvinia, *Salvinia molesta* (Salvinaceae): evaluation of sub-optimum temperatures on survival of the giant salvinia weevil, *Cyrtobagous salviniae* (Coleoptera: Curculionidae) and integration of management practices with aquatic herbicides.**  
M.S. Thesis (Plant, Environmental and Soil Sciences); Louisiana State University, Baton Rouge, Louisiana; 82 pp. (December 2017). Cozard LW.

## REMOTE SENSING

**Estimating *Spartina alterniflora* fractional vegetation cover and aboveground biomass in a coastal wetland using SPOT6 satellite and UAV data.**  
Aquatic Botany 144(1):38-45 (January 2018). Zhou ZM; Yang YM; Chen BQ.

**Using unmanned aerial vehicles for high-resolution remote sensing to map invasive *Phragmites australis* in coastal wetlands.**  
International Journal of Remote Sensing 38(8-10):2199-2217 (2017). Samiappan S; Turnage G; Hathcock L; Casagrande L; et al.

**A satellite-based assessment of the distribution and biomass of submerged aquatic vegetation in the optically shallow basin of lake Biwa.**  
Remote Sensing 9(9): Article Number: 966 (September 2017). Yadav S; Yoneda M; Tamura M; Susaki J; et al.

**Estimating mangrove canopy height and above-ground biomass in the Everglades National Park with airborne LiDAR and TanDEM-x data.**  
Proceedings of the Greater Everglades Ecosystem Restoration (GEER 2017): Advancing Science, Restoring the Everglades, 17-20 April 2015, Coral Springs, Florida; (abstract p. 378). Feliciano EA; Wdowinski S; Potts MD; Lee SK; et al.

**Using hyperspectral reflectance data to assess biocontrol damage of giant salvinia.**  
Geocarto International 28(6):502-516 (October 2013). Everitt JH; Yang CH; Summy K; Nachtrieb JG.

**A MODIS-based novel method to distinguish surface cyanobacterial scums and aquatic macrophytes in Lake Taihu.**  
Remote Sensing 9(2): Article Number: 133 (February 2017). Liang QC; Zhang YC; Ma RH; Loiselle S; et al.

## MODELS

**Metrics for macroscale invasion and dispersal patterns.**  
Journal of Plant Ecology 11(1):64-72 (February 2018). Clark TL; Iannone BV; Fei SL.

**Modeling the compensatory response of an invasive tree to specialist insect herbivory.**  
Biological Control 117(1):128-136 (February 2018). Zhang B; Liu X; DeAngelis DL; Zhai L; Rayamajhi MB; Ju S. [*Melaleuca quinquenervia*]

**Metrics for macroscale invasion and dispersal patterns.**  
Journal of Plant Ecology 11(1):64-72 (February 2018). Clark TL; Iannone BV; Fei SL.

**Growth dynamics of water hyacinth (*Eichhornia crassipes*): a modeling approach.**  
Rendiconti Lincei-Scienze Fisiche e Naturali 28(1):169-181 (March 2017). Eid EM; Shaltout KH.

**Wind effects on habitat distributions of wind-dispersed invasive plants across different biomes on a global scale: assessment using six species.**  
Ecological Informatics 42(1):38-45 (November 2017). Wan JZ; Wang CJ; Yu FH.

**Refining species distribution model outputs using landscape-scale habitat data: forecasting grass carp and Hydrilla establishment in the Great Lakes region.**  
Journal of Great Lakes Research 43(2):298-307 (April 2017). Wittmann ME; Annis G; Kramer AM; Mason L; et al.

**A semi-empirical model of the aquatic plants seasonal dynamics and its application for management of perennial macrophytes.**  
Aquatic Botany 143:1-17 (October 2017). Sukhodolova T.

## ECONOMICS

**Economics of invasive species policy and management.**  
Biological Invasions 19(11) Special Issue (November 2017). Epanchin-Niell RS.

**Economic effects and the efficacy of intervention: exploring unintended effects of management and policy on the spread of non-indigenous species.**  
Biological Invasions 19(6):1795-1810 (June 2017). Chivers C; Drake DAR; Leung B.

**The aliens among us: how invasive species are transforming the planet--and ourselves.**  
Yale University Press, New Haven, Connecticut; 367 pp. [2017]. Anthony L.

**Invasive elodea threatens remote ecosystem services in Alaska: a spatially-explicit bioeconomic risk analysis.**  
Ph.D. Dissertation, University of Alaska Fairbanks, (May 2017) 192 pp. Schwoerer T.

## Program in Fisheries and Aquatic Sciences

By Chuck Cichra

Chuck Cichra is extensively involved in UF's teaching, extension, and research programs in his role at the Program in Fisheries and Aquatic Sciences (FAS). In "Introduction to Fishery Science" and "Fish and Limnology," he conducts hand-on labs in which students learn to identify many of Florida's native and exotic aquatic plants, how plants affect water quality and fish populations, along with the various methods used to control them when they become weeds. Through lectures, students are introduced to common aquatic plants inhabiting Florida's springs, rivers, and lakes; how to sample them; and their role in these ecosystems. Students analyze 30 years of fish and water quality data collected by his students from Lake Alice on the UF campus. They examine how major environmental and management changes in the lake (e.g., blue tilapia winter kills, stocking of grass carp, aquatic weed harvesting, removal of treated sewage effluent, fluctuating water levels) affect the fish community of the lake. Students are required to write a journal-style article and orally present their findings.



As part of his "Fishing for Success" Extension program ([sfrc.ufl.edu/fish/outreach/ffs](http://sfrc.ufl.edu/fish/outreach/ffs)), youth and their parents are introduced to freshwater plants, invertebrates, and fish. During on-site events, youth collect plants and invertebrates from ponds located at the Center for Aquatic and Invasive Plants and FAS facility in northwest Gainesville. His biologists and graduate students help the participants to identify the plants and invertebrates, and then discuss their biology, ecology, and life history. Attendees then participate in a hands-on examination of several common native and exotic fish, followed by a chance to fish in the ponds at the facility. At various off-site events, aquatic plants and invertebrates are displayed and discussed with the public. This past year, Fishing For Success hosted 8,000 on-site and 6,000 off-site participants.

Numerous "pond and lake management" Extension workshops, displays, and presentations were conducted throughout Florida and south Georgia, in conjunction with county and state extension faculty. Two of the bigger events included displays at the Holmes County, Florida Outdoors

Show and a 3-day Aquaculture and Pond Management program at the Sunbelt Ag Expo in Moultrie, Georgia. These focused on aquatic weed, fish, and water quality management. Nearly 4,000 participants learned proper



*Fishing for Success event at the Center and FAS ponds*

techniques to manage their ponds for better fishing.

Research this past year focused on examining the impacts of recreational activities on the aquatic plants and water quality of the Rainbow River, Florida. Jesse Stephens, a Fisheries Masters student, completed and successfully defended his thesis research. A portion of this work was to replicate research conducted on the river in 1994 and 1995 (Mumma et al. 1996) to determine what changes have occurred in the aquatic plant community over the past 20+ years. Jesse's thesis title is "Impact of recreational activities on the aquatic macrophyte community of Rainbow River, Florida (USA)".

A graduate student, Erin Haws, started on her Master's thesis with us last fall although her work is being done in Iowa with the cooperation of every regional Iowa DNR lake management biologist. Erin is conducting a comprehensive study on reservoir and lake fish habitat in Iowa to provide managers with a better understanding of local fish habitat impairments and potential differences in appropriate restoration methods. Connection of qualitative impairment factors with easily-measured water quality, physical, and biological metrics will allow for better tracking of fish habitat impairments and improvements in Iowa. Rebecca Krogman, an Iowa DNR Large Impoundments Research Biologist, is co-advising and funding Erin's research.

Chuck Cichra, Professor and Fisheries Extension Specialist  
School of Forest Resources and Conservation  
Program in Fisheries and Aquatic Sciences  
352-273-3621  
[cecichra@ufl.edu](mailto:cecichra@ufl.edu)

Update from Mike Netherland, continued from page 2

Jens Beets is a current Master's student and will likely finish up in December 2018. Jens' thesis work includes milfoil hybridity in relation to invasive growth and differential susceptibility of hybrid milfoils to herbicide treatments. He published his first paper in January 2018, and he is currently working on drafts for two more. In addition to his Master's Project, I have also had Jens work on the factors contributing to declines of Kissimmee grass in Florida. Through his mesocosm efforts and Dean's field work we have been able to rule out several suspected factors through this research. Jens remains uncommitted regarding his post-graduation plans, but he has said he wants to continue working with invasive aquatic plants.

For those keeping tabs, we are training and retaining people in the field of aquatic plant management. This is a big source of pride for me.

Michael D. Netherland, Ph.D, US Army ERDC  
7922 NW 71st Street Gainesville, FL 32653  
352-392-0335  
mdnether@ufl.edu

Update from Dr. Enloe's Lab, continued from page 2

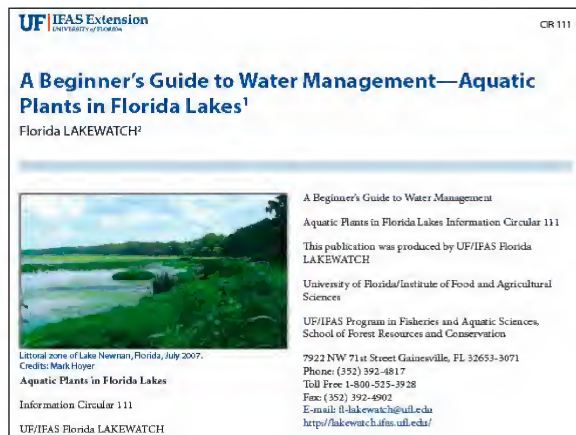
Finally, we are aggressively continuing the efforts on Old World climbing fern (*Lygodium microphyllum*) in south Florida. My biologist, Jonathan Glueckert, has been extremely busy conducting herbicide studies across south Florida. This year, we have found very promising activity with several herbicides including new formulations of triclopyr (Trycera and Vastlan HL), the soon-to-be registered Procellacor, and aminocyclopyrachlor (Method). We are now moving into operational studies in Loxahatchee National Wildlife Refuge (NWR) to quantify non-target issues and seasonality of treatment. We are very grateful to the South Florida Water Management District, FWC, and the Loxahatchee NWR for funding this work.

On a final note, I am very grateful to Drs. Bill Haller and Mike Netherland for all their support and mentoring over the last three years. Both have been extremely helpful in getting my program up and running and I cannot thank them enough!

Stephen Enloe, Associate Professor, Agronomy Department  
Center for Aquatic and Invasive Plants  
352-392-6841  
sfenloe@ufl.edu

## Florida LAKEWATCH and Aquatic Plants

By Mark V. Hoyer



Florida LAKEWATCH is a volunteer water quality monitoring program. It was started in 1986 when Lake Santa Fe residents started asking for science-based information on their lake. They wanted to become better stewards and lake managers. Many other lakes soon followed with other residents asking questions about the most important lake in Florida, "My Lake." While there are many different types

of questions about lake management, the number one issue is always regarding the management of aquatic plants. For this reason, Florida LAKEWATCH staff has written an information circular entitled "A beginners guide to water management – Aquatic Plants in Florida. Information Circular #111", which can be found on the Florida LAKEWATCH web site ([http://lakewatch.ifas.ufl.edu/pubs/circulars/Circular111\\_FA16300\\_pdf10-22-14.pdf](http://lakewatch.ifas.ufl.edu/pubs/circulars/Circular111_FA16300_pdf10-22-14.pdf)).

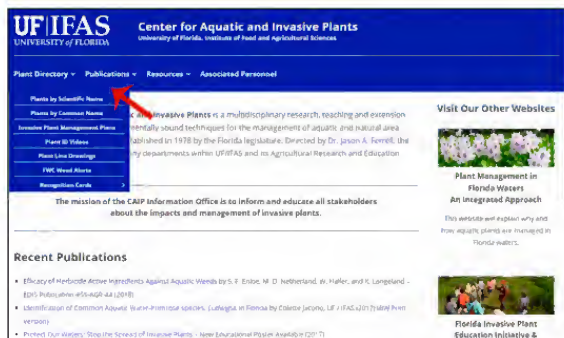
The Center for Aquatic & Invasive Plants lends some financial support to the LAKEWATCH program. The funds this year were used to send three Regional Coordinators and the Director of the program to the Florida Aquatic Plant Management Society annual conference. This conference is important to the LAKEWATCH staff so they can keep up to date with the current status of aquatic plant management, allowing them to accurately answer questions from stakeholders. LAKEWATCH thanks CAIP for the continued support.

Mark V. Hoyer, LAKEWATCH Director  
Research Programs and Services  
352-273-3611  
mvhoyer@ufl.edu

# What's Inside the Center's Website

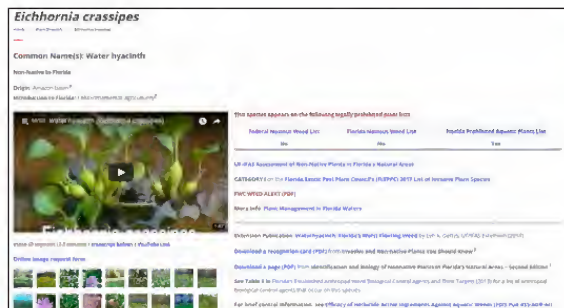
By Karen Brown

The **UF/IFAS Center for Aquatic and Invasive Plant's website** ([plants.ifas.ufl.edu](http://plants.ifas.ufl.edu)) is much more than a departmental website. It is also the gateway into almost everything the Information Office here does. Our office created the original website and has added to it and managed and modernized it since its inception. As an introduction, the Center was established in 1978 by the Florida Legislature to develop environmentally sound techniques for the management of aquatic and natural area weed species. As a multidisciplinary research, teaching and extension unit, the Center's website aims to "...inform and educate all stakeholders about the impacts and management of invasive plants." Follow along for a brief tour.



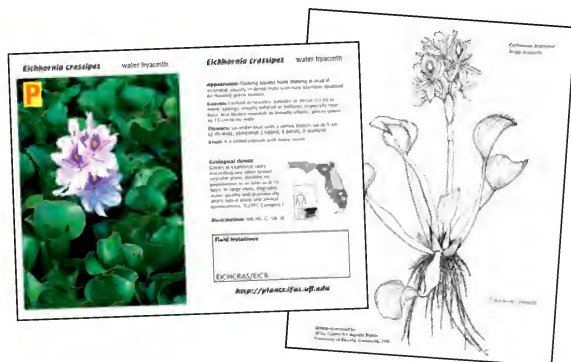
Main website homepage with Plant Directory menu

The home page contains our Plant Directory which drops down to a selection of approximately 430 plant profile pages. All of these contain photos, and a table indicating regulatory status (i.e., whether or not they are prohibited by federal or state law) and a link to the UF/IFAS Assessment of Non-Native Plants in Florida's Natural Areas. If they



Sample plant profile page

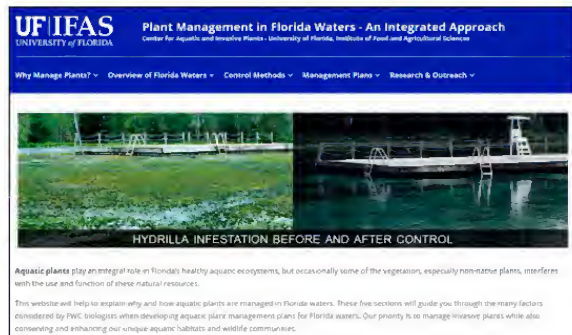
are on the Florida Exotic Pest Plant Council's List of Invasive Plant Species (2017), their category is indicated (I or II). Many of these (more than 120) also have short plant identification videos. Relevant species have links to either *Integrated Management of Nonnative Plants in Natural Areas of Florida* (EDIS Pub. SP 242) or *Efficacy of*



Examples of a plant recognition card and line drawing

*Herbicide Active Ingredients Against Aquatic Weeds* (EDIS Pub. #SS-AGR-44), IFAS Extension publications providing control information. Also included on many of these plant webpages are botanical line drawings, management plans, weed alerts, recognition cards that can be downloaded, and more. Other tabs on this web site include management plans, publications (both free and for sale), and other resources. This section of our website receives a lot of traffic, averaging 500,000 visits per year.

The Center's home page also serves as the portal to 3 other important websites representing additional aspects of our work. **Plant Management in Florida Waters** aims to bridge the gap between aquatic plant research and agency personnel, plant managers, stakeholders and others interested in this



Plant Management in Florida Waters homepage

field. Plant management in public waterbodies is loaded with conflicts – just ask an herbicide applicator caught in the act of doing his job! Being part of the University of Florida is an important asset; many citizens feel loyalty and confidence in UF and know us as unbiased in our outreach. We have produced business cards for plant managers to direct citizens and others to this website when they have questions. This can deflect a difficult conversation and redirect it to us. These cards are offered in quantities to aquatic plant management



*Plant Management webcard*

crews and they fit easily into pockets and wallets. Our website explains why and how aquatic plants are managed in Florida, complete with two short introductory videos with accompanying fact sheets. The home page of this website



*Introductory videos explaining the problem with invasive plants*

provides links to Florida's most invasive aquatic plants: aquatic soda apple, giant salvinia, hydrilla, Hygrophila, napier grass, para grass, torpedograss, water hyacinth, water lettuce, water spinach, West Indian marsh grass, wild taro, crested floating heart, feathered mosquitofern, Cuban club-rush, Uruguayan waterprimrose, and Lyngbya. It also provides an overview of Florida waters and covers the control methods available for aquatic plant management. Developing Management Plans provides detailed considerations used by the Florida Fish and Wildlife Conservation Commission (FWC) when developing management strategies. This is the most content-rich section of this website and is well worth exploring in more detail. Chemical Control Considerations alone contains 5 sections: Reducing Pesticide Use in Florida Waters, APMS Herbicide Resistance Management Module, Herbicides Registered for Use in Florida Waters, Aquatic Plant Resistance to Herbicides, and a Herbicide Considerations Reference Guide. These precede full considerations for using each of the 17 aquatic herbicides registered for use in Florida.

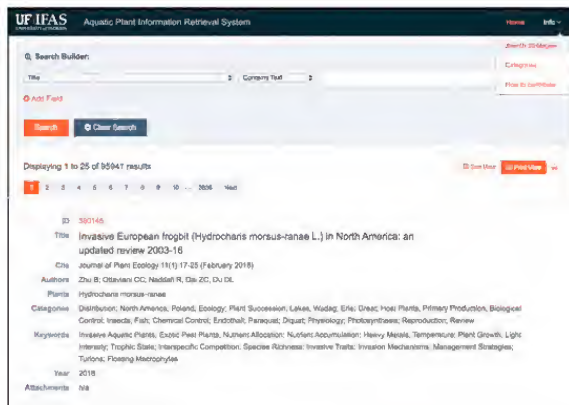
A second website linked from the Center's home page is the **Florida Invasive Plant Education Initiative**. Coordinator Dehlia Albrecht has written an update on this project – see page 6-7. The Initiative was created to provide educators with the information and resources needed to teach students about the harmful impacts some non-native, invasive plants are having on our natural areas. The ultimate goal is for today's youth to draw on this knowledge as they mature into



*Education Initiative homepage*

responsible environmental stewards.

Last but not least, there is the **Aquatic Plant Information Retrieval System (APIRS)**, in existence for decades and the beginning of the Information Office. This searchable bibliographic database was originally created with funding from the US Agency for International Development to help provide resources for developing countries with catastrophic aquatic weed problems. Today it continues to do so but



*APIRS Database homepage*

focuses more on problem species in Florida and areas with species that are potentially on their way here. Lisa Olsen now manages APIRS and regularly adds new references to the collection. See **From the Database** on pages 10-13 for a sample of entries. To use the database online, go to APIRS and view the helpful **Search Strategies** link in the dropdown menu under **Info** in the upper right corner of the APIRS homepage.

Importantly, we have a long history of partnering with FWC's Aquatic and Invasive Plant Management Sections on most all of the work done at the Center. We are grateful for their financial support of this partnership.

Karen Brown, Coordinator, Educational Media/Communications  
University of Florida/IFAS  
Center for Aquatic and Invasive Plants



## New Book!

### *Journal of Aquatic Plant Management Research Methods*

Aquatic weeds are not simply a nuisance since their presence can severely limit fish populations and lake productivity. They also reduce the ability to move irrigation and flood water in canals which endangers human health and property and puts thousands of acres of crop land at risk. In other words, invasive weeds represent a significant natural disaster if not managed effectively. However, managing weeds in aquatic systems provides challenges not faced in the greater weed science community where weeds typically occur in terrestrial habitats. Additionally, aquatic weeds grow in dynamic systems so the research and management techniques utilized are not as standardized as those in terrestrial habitats.

Researchers within the Aquatic Plant Management Society have encountered these issues for many years and have developed effective techniques and approaches to overcome these challenges. Research Methods taps into this talent and provides 14 chapters of techniques and guidelines for addressing these complex topics in aquatic environments. This publication will prove to be an excellent reference for new researchers, regulatory officials, and natural resource managers who have an interest in aquatic plant management.



Visit the APMS website to order: \$35

[www.apms.org](http://www.apms.org)

#### CENTER FOR AQUATIC AND INVASIVE PLANTS

Dr. Jason A. Ferrell, Director

Dr. William Haller, Professor Emeritus

Dr. Stephen Enloe, Associate Professor

Dr. Deah Lieurance, Assistant Extension  
Scientist

Dr. Mike Netherland, Courtesy Associate  
Professor, US Army Engineer Research  
and Development Center

Kim Lottinville, Administrative Assistant

Karen Brown, Coordinator, Educational  
Media/Communications

Dehlia Albrecht, Education Initiative  
Coordinator

Lynda Dillon, Education Initiative  
Program Assistant

Lisa Olsen, Library Assistant II

Charlie Bogatescu, Web Developer II

## AQUAPHYTE

**AQUAPHYTE** is the newsletter of the Center for Aquatic and Invasive Plants (CAIP) of the University of Florida / Institute of Food and Agricultural Sciences (UF/IFAS). Support for CAIP is provided by UF/IFAS and the Florida Fish and Wildlife Conservation Commission, Invasive Plant Management Section.

**AQUAPHYTE** is sent to managers, researchers and agencies in numerous countries around the world. Comments, announcements, news items and other information relevant to aquatic and invasive plant research are solicited.

Inclusion in **AQUAPHYTE** does not constitute endorsement, nor does exclusion represent criticism, of any item, organization, individual, or institution by the University of Florida.

**EDITOR:** Karen Brown, [kpbrown@ufl.edu](mailto:kpbrown@ufl.edu)

**UF | IFAS**  
UNIVERSITY of FLORIDA

University of Florida  
Institute of Food and Agricultural Sciences  
Center for Aquatic and Invasive Plants  
7922 NW 71st Street, Gainesville, FL 32653-3071 USA  
[caip-website@ufl.edu](http://caip-website@ufl.edu) • [plants.ifas.ufl.edu](http://plants.ifas.ufl.edu)